



Report on the FY04 Forest Products Portfolio Peer Review

Overview of the Portfolio

The Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy's (EERE) Industrial Technology Program (ITP) supports a diverse portfolio of cost-shared, pre-competitive research projects that focus on reducing the forest products industry's energy intensity. The goal of this portfolio is to fund projects that carry risks that are too significant for industry to fund alone yet will have high impacts on the industry's energy use. The portfolio evolves over time as research and development (R&D) projects are funded and completed, as new opportunities to have a significant impact on the industry are identified, and as national priorities change.

The Forest Products portfolio was restructured in the 2004 Fiscal Year (FY04) to target four manufacturing-related focus areas that offer the greatest opportunity for energy savings: (1) Enhanced Raw Materials, (2) Next Generation Mill Processes, (3) Improved Fiber Recycling, and (4) Wood Processing. Each of these focus areas supports ITP's mission to reduce the energy intensity of industry while enhancing productivity and economic growth. The *Enhanced Raw Materials* area focuses on advances in genetics, silviculture, and biotechnology that can be harnessed to develop improved feedstock (whole trees and wood chips) which, in turn, can lower energy demands in the manufacture of pulp, paper, and wood products. *Next-Generation Mill Processes* include all of the industrial processes used to produce paper from raw materials, with particular emphasis on developing breakthrough technologies for more energy-efficient pulping, bleaching, chemical recovery, and papermaking. *Improved Fiber Recycling* includes development of innovative, energy- and water-efficient processes to separate, repulp, screen, clean, and deink recovered paper products. *Wood Processing* includes R&D to improve the energy efficiency of wood products drying, curing/processing, and emissions control.

Portfolio Management

R&D projects for the Forest Products portfolio are selected through open, competitive solicitations. The solicitation process starts with the request for proposals, which announces the technology areas for projects that will be considered for funding. These areas are established using the ITP Strategic Plan, Multi-Year Plan, analytic studies, industry inputs, and the data collected during program and portfolio reviews to identify portfolio gaps and priorities. Insofar as the budget allows, solicitations are designed to attract cost-shared collaborative project proposals that have the potential to *significantly* increase energy efficiency and improve environmental performance and product yield. A team of industry experts reviews, evaluates, and ranks submitted proposals based on the technical evaluation criteria specified in the solicitation. These industry experts then recommend only the top proposals for consideration by the selection official. The selection official evaluates the recommended proposals using program policy factors identified in the solicitation and selects the projects that will best support ITP's goals and objectives. The Golden Field Office (GFO) contracting and project management team negotiate and award each of the selected projects, monitor cost and technical progress, review quarterly cost and progress reports, perform site visits and modify the awards. Active R&D projects in the Forest Products portfolio are evaluated in an annual Portfolio Peer Review. The Forest Products portfolio review process was restructured in FY04 to follow the newly developed EERE guidelines for peer reviews. This new process uses retired industry experts to gather feedback on the portfolio. The findings of the portfolio review are then considered by ITP managers, project management staff, and researchers in setting priorities, conducting operations, and improving projects.

Purpose of the Portfolio Peer Review

The FY04 Forest Products Portfolio Peer Review was held May 3-6, 2004, in conjunction with Paper Summit 2004 and the TAPPI Spring Technical and International Environmental Conference in Atlanta, Georgia. The Portfolio Peer Review was designed to:

- » Expose a wide public audience to the ongoing research in the Forest Products portfolio
- » Increase opportunities for networking between the principal investigators and potential research or commercialization partners
- » Generate detailed performance evaluations of each project to give the R&D teams constructive feedback on their projects and assist the Department of Energy (DOE) in ongoing project management
- » Provide a "big-picture" perspective of the overall portfolio and generate feedback on the overall balance and performance of the portfolio to help guide future DOE solicitations.

The Portfolio Peer Review Process

Forty seven technical papers on active and emerging projects from the Forest Products IOF portfolio were presented in three concurrent sessions at the TAPPI conference on May 3rd, 4th, and 5th. Industry stakeholders were encouraged to attend these open technical sessions and provide feedback on the projects to DOE. The sessions were also open to any registered attendee of the TAPPI Technical Conference. The TAPPI conference's overall attendance was 637 representatives from across the industry. ITP also hosted a booth in the exhibit hall which recorded an additional 3,036 visitors. This was the single largest event ever to integrate an ITP subprogram R&D portfolio review into its conference schedule.

Prior to the review, a list of retired industry experts was submitted to ITP by the American Forest and Paper Association (AF&PA). Nine of these experts were selected to be peer reviewers for the FY04 review. ITP convened these experts into 3 panels of 3 reviewers each to evaluate 45 active and emerging projects in closed-door sessions. The reviewers signed non-disclosure agreements to ensure the confidentiality of information presented on the projects. Each project was evaluated by the reviewers using four major criteria:

1. Programmatic Benefits (benefits to DOE and Industry)
2. Technical Merit (likelihood of technical success)
3. Commercialization Potential (includes knowledge transfer for earlier research stages)
4. Overall Project Assessment

On the fourth day of the review, all 9 industry expert reviewers met for a facilitated session. During this session, the reviewers were afforded the opportunity to discuss and consider each project's major strengths and weaknesses prior to submitting their final evaluations to ITP.

Feedback on the review process from the reviewers and the PIs that participated in the review was also collected to help ITP improve the review process. The following are some of the key recommendations made to improve the review process:

- Continue to require the participation of all active projects in the portfolio peer review.
- Give the project principal investigators (PIs) and reviewers as much time as possible to prepare for the review and to make travel arrangements.
- Continue the use of industry experts as reviewers for the Portfolio Peer Review. Request an update to the list of experts from AF&PA prior to the next peer review.
- Provide the FY04 project evaluations to the reviewers of the next portfolio review.

The Portfolio Peer Review Results

Project evaluations were conducted on 45 Forest Products R&D projects; 40 of these were active FY04 projects and 5 were emerging projects that were completed prior to FY04 but have potential for follow-on

work funded by future solicitations. Exhibit 1 lists all of the projects that participated in the FY04 review.

Exhibit 1: Forest Products Projects that Participated in the FY04 Review

Enhanced Raw Materials Projects

- Performance and Value of CAD-Deficient Pine (*North Carolina State University*)
- Improving Wood Properties through Genetic Manipulation: Engineering of Syringyl Lignin in Softwood Species (*North Carolina State University*)
- Environmental Influences on Wood Chemistry and Density of Populus and Loblolly Pine (*Oak Ridge National Laboratory*)
- Development and Validation of Sterility Systems for Trees (*Oregon State University*)
- Genetic Augmentation of Syringyl Lignin in Low-lignin Aspen Trees (*Michigan Technological University*)
- Quantifying and Predicting Wood Quality of Loblolly and Slash Pine Under Intensive Forest Management (*University of Georgia*)
- Exploiting Genetic Variation of Fiber Components and Morphology in Juvenile Loblolly Pine (*North Carolina State University*)
- Molecular Physiology of Nitrogen Allocation in Poplar (*University of Florida*)
- Search for Major Genes Using Progeny Test Data to Accelerate the Development of Genetically Superior Loblolly Pine (*North Carolina State University*)*

Wood Processing Projects

- An Innovative Titania-Activated Carbon System for Removal of VOCs and HAPs from Pulp, Paper, and Paperboard Mills (*University of Florida*)
- VOC and HAP Recovery Using Ionic Liquids (*Oregon State University*)
- Implementing Strategies for Drying and Pressing Wood Without Emissions Control (*Institute of Paper Science and Technology*)
- Improving Dryer and Press Efficiencies through Combustion of Hydrocarbon Emissions (*Institute of Paper Science and Technology*)
- Rapid, Low Temperature Electron X-Ray and Gamma Beam Curable Resins (*Oak Ridge National Laboratory*)
- Fast Curing of Composite Wood Products (*Institute of Paper Science and Technology*)
- Wireless Microwave Wood Moisture Measurement System for Wood Drying Kilns (*University of Tennessee*)
- Microwave Pretreatment: In Mill Evaluation, Kiln Schedule, and Process Model (*Oak Ridge National Laboratory*)
- Experimental Assessment of Low-Temperature Plasma Technologies for Treating VOC Emissions (*Drexel University*)

Improved Fiber Recycling Projects

- Mechatronic Design and Control of a Waste Paper Sorting System for Efficient Recycling (*North Carolina State University*)
- Decontamination of Process Streams through Electrohydraulic Discharge (*Institute of Paper Science and Technology*)
- Surfactant Spray: A Novel Technology to Improve Flotation Deinking Performance (*Georgia Institute of Technology*)

Next Generation Mill Processes Projects

- Improved Recovery Boiler Performance through Control of Combustion, Sulfur and Alkali Chemistry (*Brigham Young University*)
- Bubble Size Control to Improve Oxygen-Based Bleaching (*Georgia Institute of Technology*)
- Use of Borate Autocauticizing to Supplement Lime Kiln and Causticizing Capacities (*Western Michigan University*)
- Guided Acoustic Wave Monitoring of Corrosion and Erosion in Recovery Boiler Tubing (*Lawrence Livermore National Laboratory*)
- Yield Improvement and Energy Savings Using Phosphonates as Additives in Kraft Pulping (*University of Minnesota*)
- Increasing Yield and Quality of Low-Temperature, Low-Alkali Kraft Cooks with Microwave Pretreatment (*Oak Ridge National Laboratory*)
- Novel Pulping Technology: Directed Green Liquor Utilization (D-Glu) Pulping (*Institute of Paper Science and Technology*)
- Corrosion in Kraft Digesters (*Oak Ridge National Laboratory*)
- Acoustic Forming for Enhanced Dewatering and Formation (*Georgia Institute of Technology*)
- Fibrous Fillers to Manufacture Ultra High-Ash Performance Paper (*G.R. International, Inc.*)
- The Lateral Corrugator (*Institute of Paper Science and Technology*)
- Contactless, Real-Time Monitoring of Paper Mechanical Behavior during Papermaking (*Institute of Paper Science and Technology*)
- On-Line Fluidics-Controlled Headbox (*Georgia Institute of Technology*)
- Development of Methane de-NOx Reburning Process for Wastewood-, Sludge-, and Biomass-Fired Stoker Boilers (*Gas Technology Institute*)
- High Selectivity Oxygen Delignification (*Institute of Paper Science and Technology*)
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- 3-D Characterization of the Structure of Paper and Paperboard and Their Application to Optimize Drying and Water Removal Processes (*University of Minnesota*)
- Laboratory Development of a High-Capacity, Gas-Fired Paper Dryer (*Gas Technology Institute*)
- Design and Demonstration of Multiport Cylinder Dryers (*Argonne National Laboratory*)
- Laser Sensors for On-Line Monitoring of Carryover in Recovery Boilers (*Sandia National Laboratory*)
- Polyoxometalate Bleaching: An Efficient, Oxygen-Based, Closed Mill Technology (*University of Wisconsin*)*
- Control of Soluble Scale Fouling in High Solids Black Liquor Concentrators (*Institute of Paper Science and Technology*)*
- Stability and Regenerability of Catalysts for the Destruction of Tars from Biomass and Black Liquor Gasification (*Georgia Institute of Technology*)*
- Particle Formation and Deposition in Recovery Boilers (*Sandia National Laboratory*)*
- Investigation of the Cause and Solution for Cracking of Recovery Boiler Primary Air Port Tubes (*Oak Ridge National Laboratory*)**
- Selection of Materials for Low Temperature Black Liquor Gasification (*Oak Ridge National Laboratory*)**
- Selection and Development of Refractory Structural Materials for Black Liquor Gasification (*Oak Ridge National Laboratory*)**

* Emerging Projects

** Projects that were presented in the open sessions but were not evaluated by the reviewers

Project evaluation reports for each project were prepared by DOE using inputs from the peer reviewers and industry stakeholders who attended the open sessions. DOE sent the individual project evaluation reports to each project's PI. Eleven projects had overall negative reviews. Five of these 11 were completed in FY03 and FY04, while six remain active. The most common weakness in these projects was the lack of a good commercialization plan due to the absence of a committed end user and/or equipment manufacturer.

Based on the project evaluations and the facilitated reviewer session, the following recommendations were made to the ITP program and GFO project managers:

- Contact and discuss the reviewer evaluations with the PIs for each of the 6 ongoing projects that had overall negative reviews.
- Work with the PIs to address the commercialization merit deficiencies noted in the project evaluation reports. For the projects that have been completed or are close to completion, identify opportunities that could accelerate commercialization.
- Ensure tracking of post-R&D results and activities for the emerging and commercialized technologies.
- Focus future solicitations on new, high-impact technologies in the Discovery and Applied Research phases. Also, consider funding larger projects that include demonstration in their scope of work. Go/no-go decision points should be clearly defined, and DOE's cost-share should decrease as the technology moves toward commercialization.
- Require a minimum of 30% cost-share from non-federal sources for projects identified as applied R&D and a minimum of 50% cost-share from non-federal sources for all demonstration projects.
- Identify and analyze new opportunities for raw materials, fiber recycling, pulping, bleaching, and papermaking technologies that could significantly reduce the energy intensity of the forest products industry.

Program and Project Management Response

The majority of the review recommendations relate to individual project management activities. ITP will use the results of the peer review to help improve and refine the Forest Products portfolio and program strategy. ITP will consider the reviewer and industry feedback as it assesses the portfolio and program priorities and opportunities. ITP and its industry stakeholders have identified many opportunities for saving energy in the forest products industry. The program will analyze these opportunities in more detail in FY05 to sharpen its strategy and, potentially, restructure its portfolio to better target the top priorities. The program will continue to work with industry to identify and define high-priority research areas and develop a technology roadmap that addresses the industry's research needs.

For more information contact:
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A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.



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